

# Bowmar Instrument Corporation

8000 Bluffton Road  
FORT WAYNE, INDIANA  
46809



**BOWMAR**

## FORT WAYNE DIVISION

8000 BLUFFTON RD., P. O. BOX 2835, FORT WAYNE, INDIANA 46809  
TEL: 219-747-3121 TWX: 219-241-2743

### Technical Information — PER YOUR REQUEST

T. NELSON, SYS. CONSULTANT

Box 1546  
POUGHKEEPSIE, NEW YORK 12603

PRINTED MATTER





JUNE 8, 1966

**BOWMAR**

FORT WAYNE DIVISION

8000 BLUFFTON RD., P. O. BOX 2835, FORT WAYNE, INDIANA 46809  
TEL: 219-747-3121 TWX: 219-241-2743

## TECHNICAL DATA TRANSMITTAL SLIP

We are pleased to forward the following technical data:

DISPLAY DIGEST AND OPTICATOR DRAWINGS

In reply to your recent request for additional information concerning:

MINIATURE LIGHTED DISPLAYS

appearing in: ELECTRONIC PRODUCTS - MARCH

For additional specifications, quotations or application assistance, please contact Mr. ROBERT P. KENNEDY

Field Engineer, at the address and phone number checked below:

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> 67 Brockton Ave.<br>Haverhill, Mass. (372-5354)                       | <input type="checkbox"/> 20203 Ann Arbor Trail<br>Dearborn, Mich. (581-5606)        | <input type="checkbox"/> 29 Honeypots Rd., Mayford<br>Woking, Surrey, England (MA-62202)        |
| <input type="checkbox"/> 75 Plandome Rd.<br>Manhasset, L. I., N. Y. (MA-7-8790)                | <input type="checkbox"/> 6713 N. Oliphant Ave.<br>Chicago, Ill. (744-8844)          | <input type="checkbox"/> 55, rue Pierre Charron<br>Paris 8, France (ELY-44-33)                  |
| <input type="checkbox"/> 15 Warrington Dr.<br>Rochester, N. Y. (271-6322)                      | <input type="checkbox"/> 1595 Selby Ave.<br>St. Paul, Minn. (646-7371)              | <input type="checkbox"/> 24, Klosterstraede<br>Copenhagen K, Denmark (PAL-26-32)                |
| <input type="checkbox"/> 40 Grove St.<br>Somerville, N. J. (526-0400)                          | <input type="checkbox"/> 6631 E. Kellogg, Rm. 223<br>Wichita, Kan. (MU-2-9433)      | <input type="checkbox"/> Schipol Airport, Bldg. 64<br>Amsterdam, the Netherlands (72-78-23)     |
| <input type="checkbox"/> 6660 Security Blvd.<br>Baltimore, Md. (944-1900)                      | <input type="checkbox"/> 110 W. Camelback Rd., Rm. 201<br>Phoenix, Ariz. (279-1221) | <input type="checkbox"/> Sonnenstrasse 14<br>8 Munich 15, Germany (55-78-32)                    |
| <input type="checkbox"/> 274 N. Graham - Hopedale Rd., Box 314<br>Burlington, N. C. (227-6677) | <input type="checkbox"/> 4971 Jackson St.<br>Denver, Colo. (388-4391)               | <input type="checkbox"/> Industrigatan 4<br>Stockholm K, Sweden (54-33-17)                      |
| <input type="checkbox"/> P. O. Box 13577<br>St. Petersburg, Fla. (347-6183)                    | <input type="checkbox"/> P. O. Box 567<br>Euless, Texas (BL-5-2632)                 | <input type="checkbox"/> Postfach 8036<br>Zurich, Switzerland (051-54 83 94)                    |
| <input type="checkbox"/> 3305 South Dixie Dr.<br>Dayton, Ohio (AX-9-0212)                      | <input type="checkbox"/> 3407 W. Olive St., Suite 210<br>Burbank, Calif. (843-4545) | <input type="checkbox"/> Via G. Carducci 31, San Giuliano Milanese<br>(Milano) Italy (984.0008) |
| <input type="checkbox"/> 3985 Race Rd., Box 11043<br>Cincinnati, Ohio (662-1616)               | <input type="checkbox"/> 275 Castro St., Box 881<br>Mt. View, Calif. (961-8510)     | <input type="checkbox"/> P. O. Box 21082<br>Tel-Aviv, Israel (22-92-93)                         |
| <input type="checkbox"/> 8000 Bluffton Rd., Box 2825<br>Ft. Wayne, Ind. (747-3121)             | <input type="checkbox"/> 10211 N.E. 31st Pl.<br>Bellevue, Wash. (VA-2-9629)         | <input type="checkbox"/> P. O. Box 114<br>Athens T-8, Greece (831-921)                          |
| <input checked="" type="checkbox"/> Box 8417<br>ROCHESTER, N.Y.                                | <input type="checkbox"/> 4979 Clemenceau St.<br>Chomedey, Que., Canada (681-5020)   | <input type="checkbox"/>  |

PRECISION PRODUCTS FOR CONTROL OF THE FUTURE

PRECISION  
COUNTER AND DISPLAY  
DIGEST





**OPTICATOR®**



**ACTUAL  
SIZE**



**LOGICATOR®**

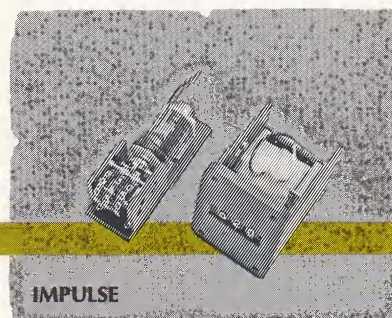
Miniature size, electronic adaptability to computer codes, fast action, simultaneous changeability of all readouts in a multi-digit assembly, and replaceability of single digit components in seconds from the front of instrumented panels are characteristics of Bowmar Opticator® and Logicator® electrically operated displays.

Single Opticator® units are self-illuminated to intensities up to 800 ft-lamberts by energizing combinations of a 7-bar incandescent matrix. Solid state converters for up to 10 digits are available for computer interfacing.

Logicator® displays are also "plug-in" modularized, with individual 3-wire readout wheels having 12 readout positions. Both types ideally suited for computerized data annotation systems.

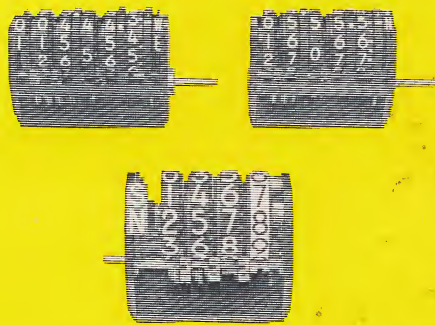
A variety of solenoid operated impulse counter designs are available with all types of digitalized readouts.

## ***ELECTRICALLY OPERATED DISPLAYS***

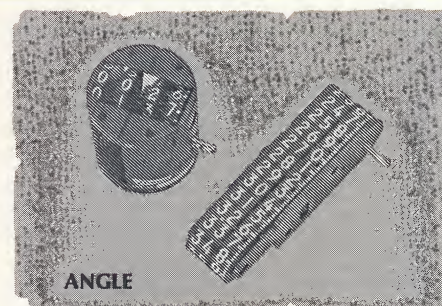


**IMPULSE**

## ***PRECISION DISPLAYS, COUNTERS,***



**REVERSING**



**ANGLE**

## ***NAVIGATIONAL***

Single-bank display of latitude or longitude, and other navigational or decimal information is provided in Bowmar reversing counters, which reverse automatically with same direction of shaft rotation at zero or high points; two to six drums. Bowmar angle counters, in standard, tape or special configurations read in degrees, minutes, seconds, tens, tenths and other heading, azimuth and ranging units; most are designed for 360° continuous reading. Variation counters provide any desired additional navigational information or combinations: symbols, words, direction, deviation, etc. In-line, tandem, split presentations and other readouts available.

**COMPLETE TECHNICAL DATA ARE AVAILABLE FOR ALL PRODUCTS DESCRIBED IN THIS DIGEST**



## B O W M A R   I N S T R U M E N T   C O R P O R A T I O N

8000 BLUFFTON ROAD, FORT WAYNE, INDIANA 46809 • Telephone 219-747-3121 • TWX 219-241-2743 • TELEX 023-227 • Cable Bowmar FWA

### Type II Opticators and Associated Electronics:

Bowmar Instrument Corporation drawings DN-3163, DN-3172, and DN-3176 describe the Type II Opticator that you have been hearing so much about.

Advantages of this Opticator Type II Display over previous designs are:

- 1) Higher voltage bulbs that are not susceptible to wide intensity variations with slight voltage variations.
- 2) Choice of intensities from 200 to 800 ft. lamberts.
- 3) Larger Character in approximately the same package size.
- 4) Use of Mil-Std Bulb.
- 5) Replaceable lamp block assembly.
- 6) Each unit is supplied with a mating connector that can be hard mounted.
- 7) High Reliability - See attachment.
- 8) Front removeable - Replace complete digit in 5 seconds.

Mounting and accessories are shown on Drawing DN-3178, DN-3190, thru DN-3194, and they are summarized on the sheet titled Opticator II Accessories.

### Associated Electronics:

Bowmar is now packaging the memory with the converter as shown in drawing DN-3172. This unit is capable of handling up to 10 digits and is priced according to the number of memory circuits required. Please specify the number of digits to be driven in each display when requesting quotations.

Advantages of the new converter, memory assembly over previous designs are:

- 1) No negative reset or bias voltages are required. On sheet 1 of DN-3172, the on/off command pulse appears as a negative pulse. This is not true and is explained in paragraph 2-B-3. As you will note, the base line is 8 volts. Elimination of these negative voltages reduces the cost of this customer's power supply and associated electronics.
- 2) This unit contains an integral power supply.



## TYPE II OPTICATOR RELIABILITY DISCUSSION

The life of the microminiature incandescent lamps used in the type II Opticator varies with the voltage applied to the filament. To increase life the voltage specified on each drawing is 20% below the lamp design rating, ie, lamp is rated at 5 volts and excited with 4 volts. This derating provides a life improvement of 14.5 times.

### DN-3163-1

The lamps used in the DN-3163-1 have an average life of 100,000 hours, ie, a 50% survival at 100,000 hours. The wearout curve departs from the random failure rate at approximately 40% of the average life. Thus, for purposes of MTBF considerations, a useful life of 50,000 hours is assumed when the lamps are excited with the rated voltage.

### DN-3163-2

In the DN-3163-2 the average life of the lamps is 25,000 hours, and the 40% point is 10,000 hours when operated at rated voltage.

### DN-3163-3

The lamps used in the DN-3163-3 have an average life of 3,000 hours, and the 40% point is 1,200 hours at rated voltage.

The reliability math models for the three units would be as follows:

### DN-3163-1

Lamp MTBF @ 80% of rated voltage = 580,000 hours.

$$\text{Lamp Block MTBF} = \frac{\text{Lamp MTBF}}{\text{Lamps/Block}} = \frac{580,000}{7} = 8.2 \times 10^4 \text{ hours.}$$

### DN-3163-2

Lamp MTBF @ 80% of rated voltage = 145,000 hours.

$$\text{Lamp Block MTBF} = \frac{\text{Lamp MTBF}}{\text{Lamps/Block}} = \frac{145,000}{7} = 2.07 \times 10^4 \text{ hours.}$$

### DN-3163-3

Lamp MTBF @ 80% of rated voltage = 17,400 hours.

$$\text{Lamp Block MTBF} = \frac{\text{Lamp MTBF}}{\text{Lamps/Block}} = \frac{17,400}{7} = 2.48 \times 10^3 \text{ hours.}$$

For the purpose of advertising a 35% safety factor should be used with the above MTBF calculations.

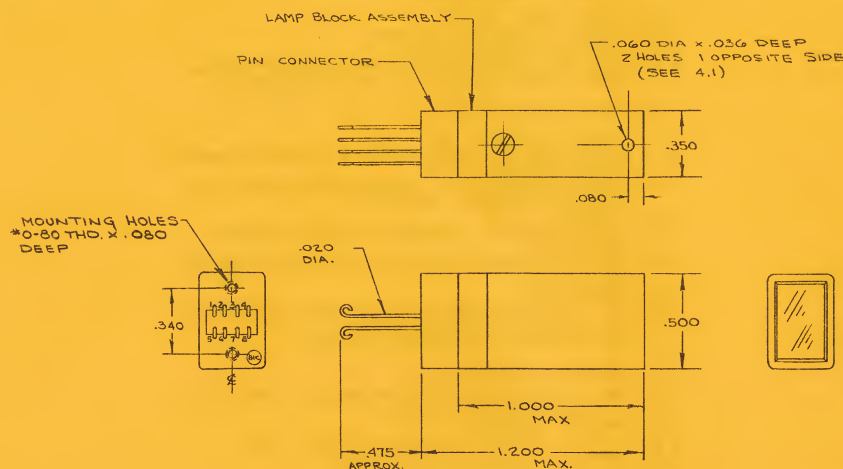
DN-3163-1	MTBF 53,000 hours
DN-3163-2	MTBF 13,400 hours
DN-3163-3	MTBF 1,600 hours

UNLESS OTHERWISE SPECIFIED

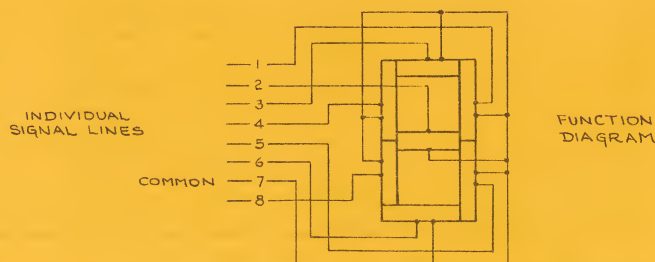
- 1—Do Not Scale Drawings.  
2—Thread Length Dimensions Are for Full Threads.  
3—Tolerances on Dimensions (Including Holes)

Decimal: ± .005  
Fractional: ± 1/2  
Angular: ± 1/2°

- 4—Remove All Burrs and Sharp Corners. .005 Max.  
5—Roughness of Surfaces Not to Exceed .63 Microinches Rms.  
6—Symbols  $\oplus$ ,  $\ominus$  and  $\otimes$  Show that Surfaces Indicated by Arrows or Some Letters (e.g., (A)) Must Be Held Concentric, Square or Parallel Respectively Within the Limits Specified.



CHARACTER FORMAT



1.0 GENERAL DESCRIPTION - THE MODEL DN-3163 OPTICATOR IS A MINIATURE, SELF-ILLUMINATED, BRIGHT PRESENTATION, DISPLAY DEVICE, WITHOUT STORAGE CAPABILITIES. IT IS DESIGNED FOR COMPATIBILITY WITH DIGITAL DEVICES AND COMPUTERS HAVING CONTINUOUS OUTPUT SYSTEMS.

2.0 ELECTRICAL CHARACTERISTICS

- 2.1 INPUT VOLTAGE: SEE TAB.  
2.2 CURRENT PER SEGMENT: SEE TAB.  
2.3 POWER PER SEGMENT: SEE TAB.  
2.4 ELECTRICAL CHARACTERISTICS ARE APPLICABLE ONLY TO NORMAL SUPPLY VOLTAGE AND NORMAL ROOM AMBIENT TEMPERATURES.

3.0 OPTICAL CHARACTERISTICS

- 3.1 SEGMENT INTENSITY  
3.1.1 NORMAL INTENSITY - LIGHT INTENSITY OF ILLUMINATED SEGMENTS AT RATED VOLTAGE: SEE TAB.  
3.1.2 REDUCED INTENSITY - LIGHT INTENSITY MAY BE REDUCED BY REDUCING THE APPLIED D.C. VOLTAGE.  
3.2 CONTRAST  
3.2.1 RATIO OF ILLUMINATED SEGMENT TO ADJACENT BACKGROUND - 100:1 MINIMUM  
3.2.2 RATIO OF ILLUMINATED SEGMENT TO UNILLUMINATED SEGMENT - 100:1 MINIMUM.  
3.3 VIEWING ANGLE  
3.3.1 ALL CHARACTERS RECOGNIZABLE AT AN ANGLE OF  $\pm 45^\circ$  FROM BOTH THE HORIZONTAL AND VERTICAL CENTERLINE.  
3.4 STYLE  
3.4.1 NUMERALS ARE FORMED BY A SEVEN SEGMENT FORMAT OF STRAIGHT BARS.

4.0 MECHANICAL CHARACTERISTICS

- 4.1 TWO HOLES ARE PROVIDED FOR EXTRACTION FROM A PANEL DISPLAY.  
4.2 REPLACEABLE LAMP BLOCK ASSEMBLY.  
4.3 MATERIAL AND FINISH  
4.3.1 HOUSING: ALUMINUM BLACK ANODIZED PER MIL-A-8625.  
4.3.2 CONNECTOR: BLACK DIALYL PER MIL-M-14.  
4.3.3 CONTACTS: PHOSPHOR BRONZE GOLD PLATED.  
4.3.4 HARDWARE: NON-CORROSIVE MATERIALS

5.0 ENVIRONMENTAL

- 5.1 ALTITUDE: PER MIL-E-5272C, PROCEDURE VI, CONDITION F.  
5.2 SHOCK: PER MIL-E-5272C, PROCEDURE V.  
5.3 VIBRATION: PER MIL-E-5272C, PROCEDURE XII, CURVE A.  
5.4 HIGH TEMPERATURE: PER MIL-E-5272C, PROCEDURE II.  
5.5 LOW TEMPERATURE: PER MIL-E-5272C, PROCEDURE I.  
5.6 HUMIDITY: PER MIL-E-5272C, PROCEDURE I.  
5.7 FUNGUS: PER MIL-E-5272C, PROCEDURE I.  
5.8 SAND AND DUST: PER MIL-E-5272C, PROCEDURE I.

DN-3163

A

OUTLINE NUMBER	INPUT VOLTAGE	CURRENT PER SEGMENT	POWER PER SEGMENT	SEGMENT INTENSITY
DN-3163-3	4V DC	71 MILLIAMPS	284 MILLIWATTS	800 MIN AVG FOOT-LAMBERTS
DN-3163-2	4VDC	66 MILLIAMPS	264 MILLIWATTS	400 MIN AVG FOOT-LAMBERTS
DN-3163-1	4VDC	53 MILLIAMPS	212 MILLIWATTS	200 MIN AVG FOOT-LAMBERTS

BOWMAR INSTRUMENT CORPORATION CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREON. THIS DRAWING IS ISSUED IN CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND MAY NOT BE REPRODUCED OR USED TO MANUFACTURE ANYTHING SHOWN WITHOUT DIRECT WRITTEN PERMISSION FROM BOWMAR TO USER.

DR. BY: JDH DATE: 4/14/65 CK. BY: DATE:										BOWMAR INSTRUMENT CORPORATION CODE 99479 FORT WAYNE, INDIANA									
APD. BY: DATE:										NAME: OPTICATOR ORIGINAL MODEL: S.O. 812 SIMILAR TO:									
APPROVAL: JHK 7/19/65										SCALE: MATERIAL:									
CHG. LET. REVISION DATE BY CK.										CHG. LET. REVISION DATE BY CK.									
PROTECTIVE FINISH										HEAT TREAT									

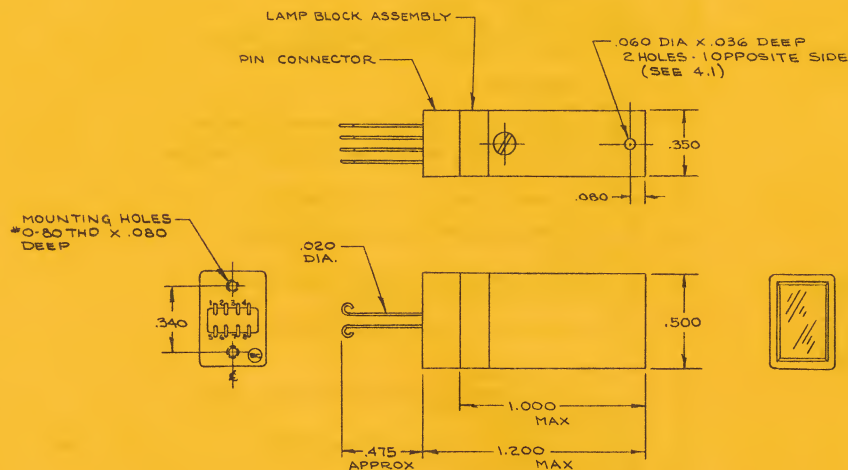


## UNLESS OTHERWISE SPECIFIED

- 1—Do Not Scale Drawings.  
 2—Thread Length Dimensions Are for Full Threads.  
 3—Tolerances on Dimensions (Including Holes)

Decimal: .005  
 Fractional:  
 Angular:  $1/2^\circ$

- 4—Remove All Burrs and Sharp Corners. .005 Max.  
 5—Roughness of Surfaces Not to Exceed .63 Microinches Rms.  
 6—Symbols  $\oplus$  and  $\ominus$  Show that Surfaces Indicated by Arrows or  
 Some Letters (e.g. (A)) Must Be Held Concentric, Square or Parallel  
 Respectively Within the Limits Specified.  
 7—



CHARACTER SIZE  
 APPROX .160 SQUARE



CHARACTER FORMAT

INDIVIDUAL  
 SIGNAL LINES

- 1  
 —2— UPPER CHARACTER  
 —3— UPPER CHARACTER  
 4  
 —5— LOWER CHARACTER  
 —6— LOWER CHARACTER  
 —7— COMMON  
 8

FUNCTION  
 DIAGRAM

## NOTES:

- 1.0 GENERAL DESCRIPTION - THE MODEL DN-3176 OPTICATOR IS A MINIATURE, SELF-ILLUMINATED, BRIGHT PRESENTATION, DISPLAY DEVICE, WITHOUT STORAGE CAPABILITIES. IT IS DESIGNED FOR COMPATABILITY WITH DIGITAL DEVICES AND COMPUTERS HAVING CONTINUOUS OUTPUT SYSTEMS.
- 2.0 ELECTRICAL CHARACTERISTICS
- 2.1 INPUT VOLTAGE: SEE TAB
- 2.2 CURRENT PER CHARACTER: SEE TAB
- 2.3 POWER PER CHARACTER: SEE TAB
- 2.4 ELECTRICAL CHARACTERISTICS ARE APPLICABLE ONLY TO NORMAL SUPPLY VOLTAGE AND NORMAL ROOM AMBIENT TEMPERATURES.
- 3.0 OPTICAL CHARACTERISTICS
- 3.1 CHARACTER INTENSITY
- 3.1.1 NORMAL INTENSITY - LIGHT INTENSITY OF ILLUMINATED CHARACTER AT RATED VOLTAGE: SEE TAB
- 3.1.2 REDUCED INTENSITY - LIGHT INTENSITY MAY BE REDUCED BY REDUCING THE APPLIED D.C. VOLTAGE.
- 3.2 CONTRAST
- 3.2.1 RATIO OF ILLUMINATED CHARACTER TO ADJACENT BACKGROUND - 100:1 MINIMUM
- 3.2.2 RATIO OF ILLUMINATED CHARACTER TO UNILLUMINATED CHARACTER - 100:1 MINIMUM.
- 3.3 VIEWING ANGLE
- 3.3.1 ALL CHARACTERS RECOGNIZABLE AT AN ANGLE OF  $\pm 45^\circ$  FROM BOTH THE HORIZONTAL AND VERTICAL CENTERLINE.
- 3.4 EACH CHARACTER IS ILLUMINATED BY TWO LAMPS.
- 4.0 MECHANICAL CHARACTERISTICS
- 4.1 TWO HOLES ARE PROVIDED FOR EXTRACTION FROM A PANEL DISPLAY.
- 4.2 REPLACEABLE LAMP BLOCK ASSEMBLY.
- 4.3 MATERIAL AND FINISH
- 4.3.1 HOUSING: ALUMINUM BLACK ANODIZED PER MIL-A-8625.
- 4.3.2 CONNECTOR: BLACK DIALYL PER MIL-M-14.
- 4.3.3 CONTACTS: PHOSPHOR BRONZE GOLD PLATED.
- 4.3.4 HARDWARE: NON-CORROSIVE MATERIALS
- 5.0 ENVIRONMENTAL
- 5.1 ALTITUDE: PER MIL-E-5272C, PROCEDURE VI, CONDITION F.
- 5.2 SHOCK: PER MIL-E-5272C, PROCEDURE V.
- 5.3 VIBRATION: PER MIL-E-5272C, PROCEDURE XII, CURVE A.
- 5.4 HIGH TEMPERATURE: PER MIL-E-5272C, PROCEDURE II.
- 5.5 LOW TEMPERATURE: PER MIL-E-5272C, PROCEDURE I.
- 5.6 HUMIDITY: PER MIL-E-5272C, PROCEDURE I.
- 5.7 FUNGUS: PER MIL-E-5272C, PROCEDURE I.
- 5.8 SAND AND DUST: PER MIL-E-5272C, PROCEDURE I.

DN-3176

A

OUTLINE NUMBER	CHARACTER DISPLAY	INPUT VOLTAGE	CURRENT PER CHARACTER	POWER PER CHARACTER	CHARACTER INTENSITY
DN-3176-9	PLUS-MINUS	4 VDC	142 MILLIAMPS	568 MILLIWATTS	800 MIN AVG FOOT-LAMBERTS
DN-3176-8	NORTH-SOUTH	4 VDC	142 MILLIAMPS	568 MILLIWATTS	800 MIN AVG FOOT-LAMBERTS
DN-3176-7	EAST-WEST	4 VDC	142 MILLIAMPS	568 MILLIWATTS	800 MIN AVG FOOT-LAMBERTS
DN-3176-6	PLUS-MINUS	4 VDC	132 MILLIAMPS	528 MILLIWATTS	400 MIN AVG FOOT-LAMBERTS
DN-3176-5	NORTH-SOUTH	4 VDC	132 MILLIAMPS	528 MILLIWATTS	400 MIN AVG FOOT-LAMBERTS
DN-3176-4	EAST-WEST	4 VDC	132 MILLIAMPS	528 MILLIWATTS	400 MIN AVG FOOT-LAMBERTS
DN-3176-3	PLUS-MINUS	4 VDC	106 MILLIAMPS	424 MILLIWATTS	200 MIN AVG FOOT-LAMBERTS
DN-3176-2	NORTH-SOUTH	4 VDC	106 MILLIAMPS	424 MILLIWATTS	200 MIN AVG FOOT-LAMBERTS
DN-3176-1	EAST-WEST	4 VDC	106 MILLIAMPS	424 MILLIWATTS	200 MIN AVG FOOT-LAMBERTS

BOWMAR INSTRUMENT CORPORATION CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREON. THIS DRAWING IS ISSUED IN CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND MAY NOT BE REPRODUCED OR USED TO MANUFACTURE ANYTHING SHOWN WITHOUT DIRECT WRITTEN PERMISSION FROM BOWMAR TO USER.

CHG. LET.		REVISION		DATE		BY		CL.		CHG. LET.		REVISION		DATE		BY		CL.	
PROTECTIVE FINISH										HEAT TREAT									
CHG. LET.		REVISION		DATE		BY		CL.		CHG. LET.		REVISION		DATE		BY		CL.	
CHG. LET.		REVISION		DATE		BY		CL.		CHG. LET.		REVISION		DATE		BY		CL.	

DR BY JOW	DATE 7/10/65	BOWMAR INSTRUMENT CORPORATION CODE 99479 FORT WAYNE, INDIANA	
CHK BY	DATE	NAME OPTICATOR	ORIGINAL MODEL S.O. 812
APD BY	DATE	SIMILAR TO	
APPROVAL [Signature]		MATERIAL	
SCALE		DN-3176	

NOTICE: WHEN RETURNING DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE YOUR PROPERTY, PLEASE MARK THEM IN CONNECTION WITH A SEPARATELY DELAILED RETURN. YOU WILL BE RESPONSIBLE FOR THE RETURN OF ANY INFORMATION RECEIVED UNDER YOUR OBLIGATION WHATSOEVER, AND THE FACT THAT THE INFORMATION MAY HAVE BEEN FURNISHED, FORWARDED, OR IN ANY WAY SUPPLIED TO ANY OTHER PERSON OR CORPORATION, OR CONVEYED ANY RIGHTS OF INVENTION TO ANY OTHER PERSON, DOES NOT AFFECT YOUR OBLIGATION TO RETURN THE INFORMATION TO THE AEC. IN ANY CASE YOU WILL BE RESPONSIBLE FOR THE RETURN OF ANY INFORMATION RECEIVED UNDER YOUR OBLIGATION WHATSOEVER.

REVISIONS				
ZONE	SYM	DESCRIPTION	DATE	APPROVAL
	A		4-2-65	RT
	H	ADD FINA	4-2-65	ED

NOTES:

1. OPERATION - THE CONVERTER MEMORY UNIT OPERATES WITH THE DISPLAY UNIT IN THE FOLLOWING MANNER: WITH THE DISPLAY ON/OFF LINE IN HIGH VOLTAGE CONDITION, A 4 WIRE BCD CODE (DEFINED BELOW) IS ENTERED ON THE DIGIT CODE LINES. THE CODE LINES ARE AT A STEADY STATE VALUE WHEN THE STORE LINE TO THE MEMORY FOR THE "A" DIGIT IS CHANGED FROM LOW TO HIGH VOLTAGE. THE STORE LINE REMAINS AT THE HIGH VOLTAGE FOR 20 MICROSECONDS MINIMUM (SEE TIMING DIAGRAM), BEFORE RETURNING TO THE LOWER INHIBIT VOLTAGE. DURING THE STORE TIME HIGH VOLTAGE PERIOD, THE BCD CODE LINES DO NOT CHANGE.

INPUT	DIGIT DISPLAYED
8 4 2 1	
0 0 0 0	0
0 0 0 1	1
0 0 1 0	2
0 0 1 1	3
0 1 0 0	4
0 1 0 1	5
0 1 1 0	6
0 1 1 1	7
1 0 0 0	8
1 0 0 1	9

SIMULTANEOUS WITH OR FOLLOWING BUT NOT PRIOR TO THE RETURN TO THE INHIBIT  
5. THE BCD CODE CHANGES. THE PERIOD OF CHANGING IS APPROXIMATELY  
5 MICROSECONDS MINIMUM. AFTER THE CODE LINES ARE AT A STEADY STATE VALUE,  
THE STATE OF THE 5 DIGIT IS CHANGED FROM LOW TO HIGH VOLTAGE.  
THE SEQUENCE DESCRIBED ABOVE IS REPEATED UNTIL ALL DIGITS MONITORED HAVE BEEN  
SET TO THEIR DESIRED VALUES. AFTER AN INDEFINITE "ON" PERIOD, THE MEMORY  
IS RESET BY CHANGING THE DISPLAY ON/OFF SIGNAL TO LOW VOLTAGE CONDITION  
AND HOLDING FOR 25  $\mu$ SECONDS MINIMUM.

- ## 2. ELECTRICAL CHARACTERISTICS

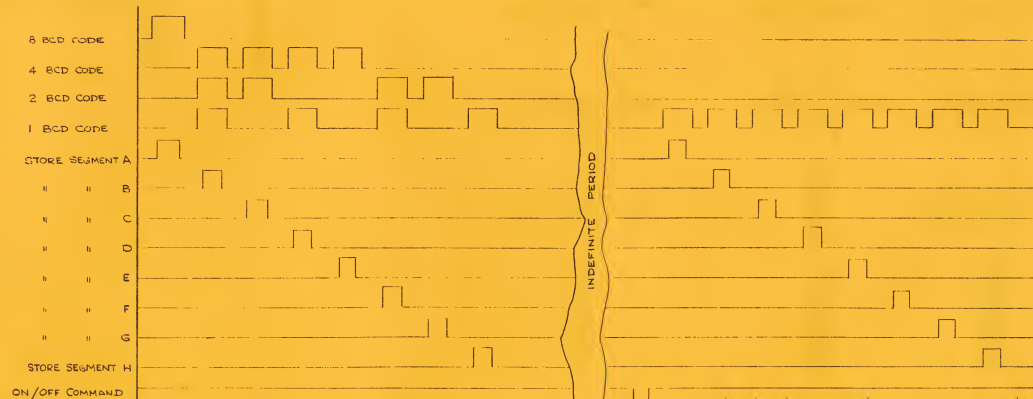
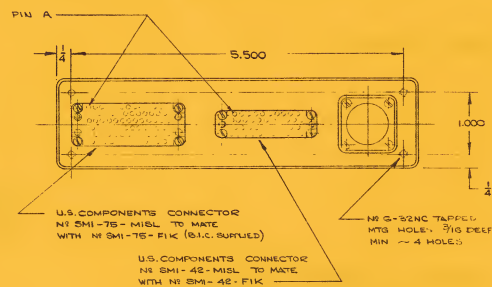
## A) POWER INPUTS

- 1) 27 TO 29 VOLTS DC WITH LESS THAN 0.500 VOLT RIPPLE AT 200 MA.
- 2) 10 TO 12 VOLTS DC WITH LESS THAN 0.5 VOLT RIPPLE AT 500 MA.
- 3) 7 TO 8V VOLTS DC WITH LESS THAN 0.500 VOLT RIPPLE AT 2.5 AMP.

### 8) SIGNAL INPUTS

- 1) BCD CODE SIGNALS - 3-10 VOLTS INTO 3K FOR A "1" AND 0 TO 0.3 VOLTS FOR A "0".
- 2) STORE SIGNALS - 3-10 VOLTS INTO 10K FOR THE COMMAND TO STORE AND 0 TO 0.300 VOLTS FOR THE COMMAND TO INHIBIT THE MEMORY.
- 3) DISPLAY ON/OFF SIGNAL - 8 TO 30 VOLTS AT LESS THAN .5 MILLIAMPERES FOR A "DISPLAY" AND 0 TO 0.300 VOLTS AT LESS THAN 2 MA FOR A "NOT DISPLAY".

3. PIN CONNECTIONS - SEE SHEET #2



### TIMING DIAGRAM

REQ'D BETWEEN NUMBER CHANGES.		ITEM	REQ'D	PART NO.	DESCRIPTION	MATL.	MATL. SPEC.	UNIT WT.
LIST OF MATERIAL								
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± .75X DECIMALS ± .005, ANGLES ± 1°					MEMORY, CONVERTER, & POWER SUPPLY PACKAGE			
DO NOT SCALE THIS DRAWING MATERIAL					CONT NO 70064 QTY. 100 PART NO. 70064 ORDER BY DATE APPROVED BY DATE CHECKED BY DATE			
NEXT ASSY		USED ON		SCALE FULL		UNIT WT		DR

DRAWING NO.  
DN3172  
SHEET 1 OF 2

MEMORY, CONVERTER,  
& POWER SUPPLY  
PACKAGE

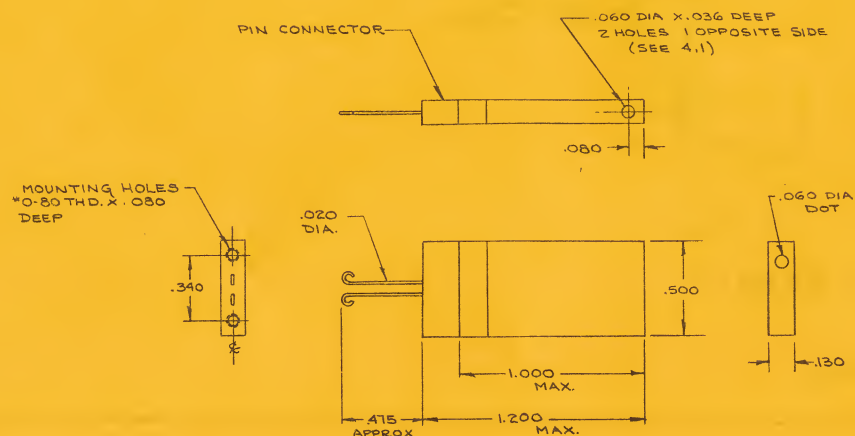
**BOWMAR INSTRUMENT  
CORPORATION**  
8000 BLUFFTON RD.  
FORT WAYNE, INDIANA

DRAWING NO.		DN3172	
CODE 00479	SHEET 1	OF 2	




Decimal  $\pm$  .005  
Fractional  $\pm$   $1/2^\circ$   
Angular  $\pm$

- 4-Remove All Burrs and Sharp Corners. .005 Max.  
5-Roughness of Surfaces Not to Exceed .05 Microinches Rms.  
6-Symbols  $\oplus$ ,  $\ominus$  and  $\otimes$  Show that Surfaces Indicated by Arrows or  
Some Letters (e.g. (A)) Must Be Held Concentric, Square or Parallel  
Respectively Within the Limits Specified.



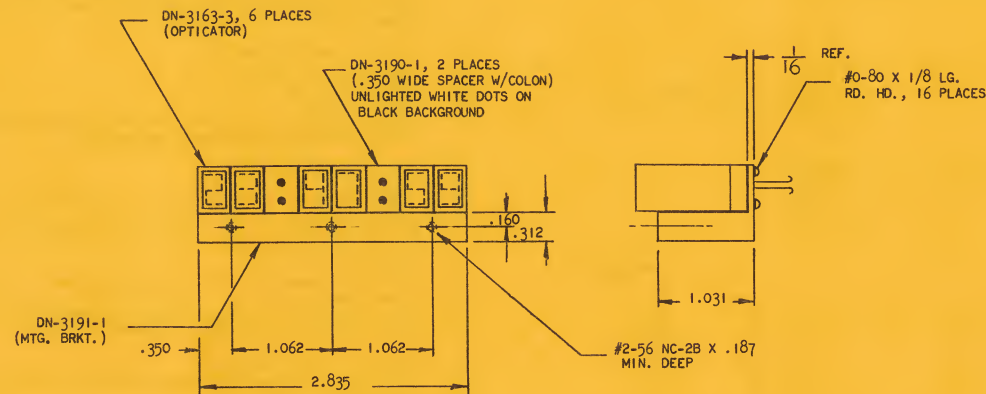
DN-3178-3	4 VDC	71 MILLIAMPS	284 MILLIWATTS	800 MIN AVG FOOT-LAMBERTS
DN-3178-2	4 VDC	66 MILLIAMPS	264 MILLIWATTS	400 MIN AVG FOOT-LAMBERTS
DN-3178-1	4 VDC	53 MILLIAMPS	212 MILLIWATTS	200 MIN AVG FOOT-LAMBERTS
OUTLINE NO.	INPUT VOLTAGE	CURRENT	POWER	INTENSITY

DR BY <i>JDA</i>	DATE <i>12/15</i>	BOWMAR INSTRUMENT CORPORATION CODE 99479 FORT WAYNE, INDIANA
CHK BY	DATE	
APD BY	DATE	
APPROVAL <i>[Signature]</i>		NAME  OPTICATOR
ORIGINAL MODEL S.O. 812		SIMILAR TO

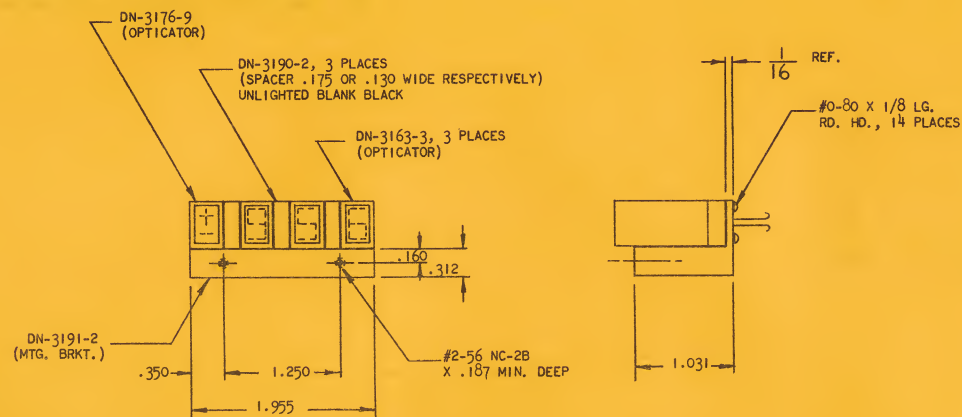
OPC. LET.	REVISION	DATE	BY	CL.	A	REVISION	DATE	BY	CL.
PROTECTIVE FINISH					HEAT TREAT				
SCALE					MATERIAL				
DN-3178									

DN-3178

--	--



OPTICATOR ASSEMBLY DN-3193

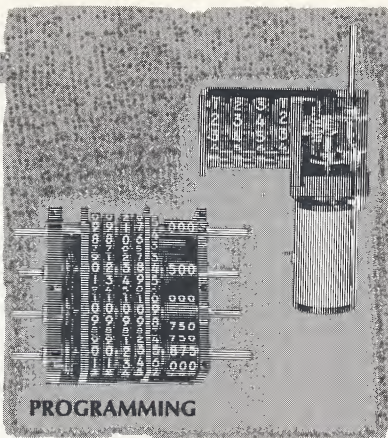


OPTICATOR ASSEMBLY DN-3194

MOUNTING BRACKET: BLACK ANODIZED ALUMINUM  
VARIATIONS IN MOUNTING BRACKET AVAILABLE

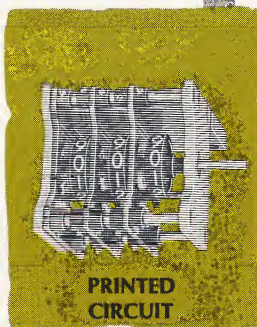
DR. BY SIGL	DATE 4/12/66	BOWMAR INSTRUMENT CORPORATION CODE 99479 FORT WAYNE, INDIANA	
CHK. BY	DATE	NAME OPTICATOR II ACCESSORIES	ORIGINAL MODEL
APD. BY	DATE		SIMILAR TO
APPROVAL			
SCALE			



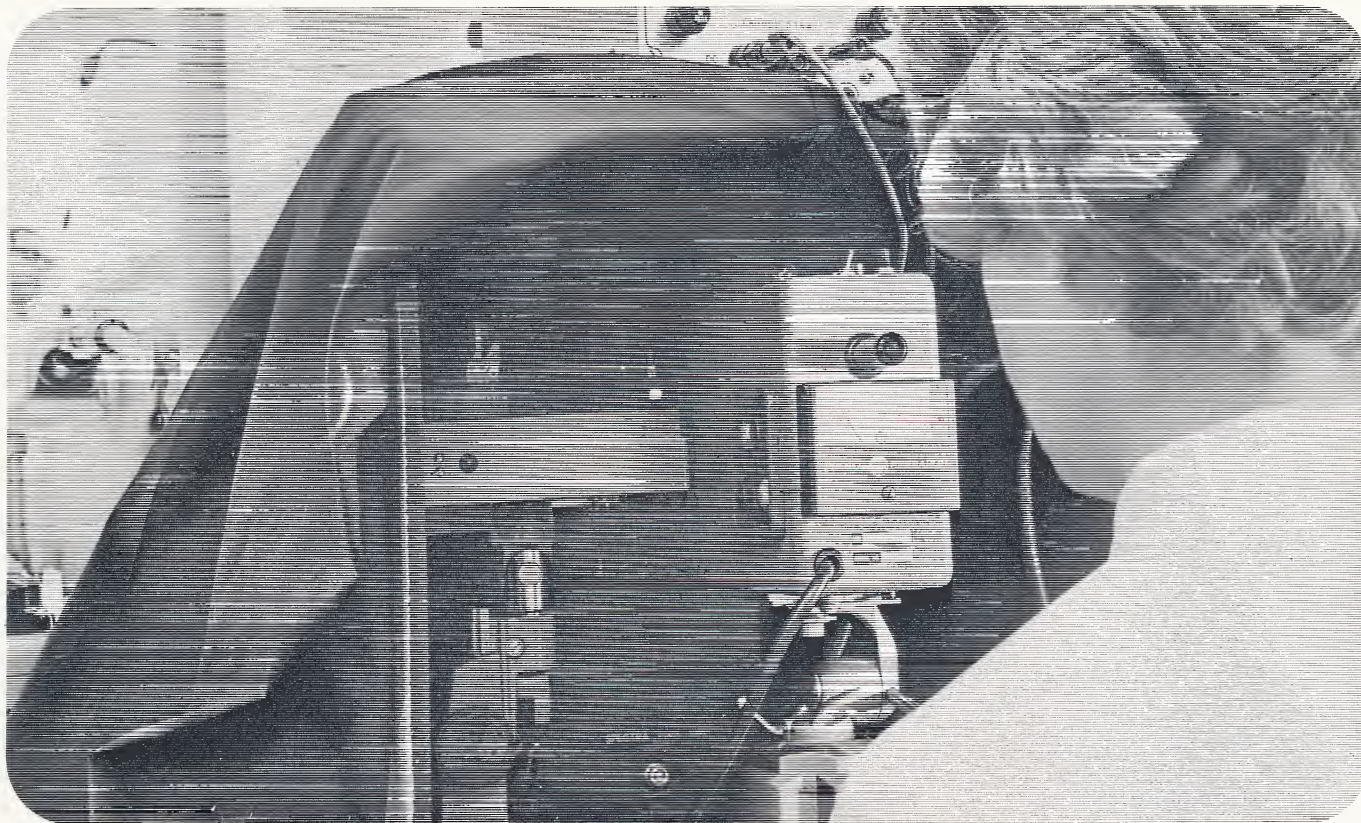


## CUSTOM DISPLAY ASSEMBLIES

Bowmar designs and manufactures an unlimited array of indicator and display packages for unique functional requirements. Typical are multi-bank, multi-shaft units for electronic communication gear frequency control and display; pot-counter assemblies; and printed circuit units for programming applications and remote readout. Thousands of variations can be designed into counter and display units, typically including electrical readout, solenoid-actuated flags, step-down ratios, hidden transfers, special stop mechanisms, and special materials for unusual environmental conditions.







The brilliance of a new Bowmar Opticator miniature computer readout is measured scientifically in this quality control station.



Servo Motors and matched  
Servo Motor-Gearheads



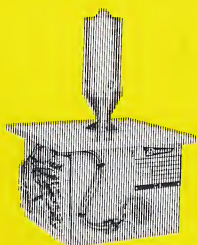
Stepper Motors



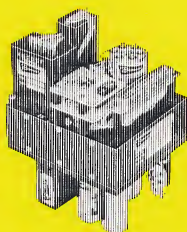
Motor-Tachometers



Synchros, sizes 8 thru 23



Standard and miniature  
Joystick Controls



Complex Servo Packages

Bowmar-Fort Wayne Division is a foremost producer of military, industrial and commercial counters, displays, and readout assemblies. F-111, Boeing 707, B-58, Mohawk OV-1C, B-52, Douglas DC-9, F-4, Polaris and F-106 are a few of hundreds of systems which rely upon thousands of Bowmar readout devices, packages and subsystems. Bowmar's position of excellence has been earned over fifteen years through engineering competence, highly refined manufacturing and quality assurance programs and techniques, and the physical facilities to respond to critical needs, environmental testing and delivery requirements. **Bowmar-Fort Wayne welcomes study or survey groups which may wish to evaluate these facilities in detail.**

**BOWMAR**

FORT WAYNE DIVISION  
8000 Bluffton Road • Fort Wayne, Indiana

